

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

14

Applicant's or agent's file reference 8K23PC	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP99/10046	International filing date (day/month/year) 17/12/1999	Priority date (day/month/year) 22/12/1998
International Patent Classification (IPC) or national classification and IPC H04Q7/24		
Applicant TELEFONAKTIEBOLAGET L M ERICSSON (PUBL) et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 5 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand  21/07/2000	Date of completion of this report  15.03.2001
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer  Forster, G  Telephone No. +49 89 2399 8986 

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP99/10046

## I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).):*

### Description, pages:

1-6 as originally filed

### Claims, No.:

1-9 as received on 06/02/2001 with letter of 06/02/2001

### Drawings, sheets:

1/2,2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP99/10046

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. Statement

Novelty (N)	Yes:	Claims	1-9
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-9
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-9
	No:	Claims	

2. Citations and explanations  
**see separate sheet**

## VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

to section V.

1. The present invention relates to a method of transmitting signalling information between two signalling points of a Public Land Mobile Network, to an apparatus for transmitting signalling information between two signalling points of a Public Land Mobile Network and to a signalling point within a Public Land Mobile Network, according to the features of the amended independent claims 1, 7 and 8 respectively.

The closest prior art document appears to be represented by the document EP-A-0 544 447 (first document cited in the international search report).

2. According to the features of the independent claims the inventive step consists in that the signalling information is formulated into a message according to the Mobile Application Part (MAP) protocol and that it is determined whether or not a destination signalling point for the MAP message is co-located, and if so, that the MAP message is passed to a packet switched data network to provide for transmission of the message over said packet switched data network and, if not, that the MAP message is passed to a Signalling System No.7 (SS7) transport mechanism to provide for transmission of the message over an SS7 network.

The underlying concept is not disclosed in or rendered obvious by the cited prior art documents. The subject-matter of the independent claims thus fulfils the requirements of Article 33 PCT.

3. The dependent claims contain further details on the subject-matter of the respective independent claims. These dependent claims merely limit the scope of protection sought by the independent claims and are therefore also considered to fulfil the requirements of Article 33 PCT.

to section VII.

1. The document EP-A-0 544 447 (first document cited in the international search report) has not been identified in the description nor has the relevant background

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/EP99/10046

art disclosed therein been discussed, Rule 5.1(a)(ii) PCT.

2. The description has not been modified to bring it into agreement with the amended independent claims, Rule 5.1(a)(iii) PCT.

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Claims

1. A method of transmitting signalling information between two signalling points of a Public Land Mobile Network, the method comprising;

formulating said signalling information into a message according to the Mobile Application Part (MAP) protocol; and

determining whether or not a destination signalling point for the MAP message is co-located and, if so, passing the MAP message to a packet switched data network to provide for transmission of the message over said packet switched data network and, if not, passing the MAP message to a Signalling System No. 7 (SS7) transport mechanism to provide for transmission of the message over an SS7 network.

2. A method according to claim 1, wherein said determining is performed at a signalling point wishing to send a Mobile Application Part (MAP) message.

3. A method according to claim 1 or 2, wherein the co-located signalling points of the PLMN coupled by the said packet switched data network include two or more of a Mobile Switching Centre (MSC), a Gateway Mobile Switching Centre (GMSC), a Home Location Register (HLR), and a Visitor Location Register (VLR).

4. A method according to any one of the preceding claims, wherein the packet switched data network is an IP network and the MAP sits on top of the IP layers at each of the co-located signalling points.

5. A method according to claim 4, wherein the co-located signalling points have access to an SS7 network and the MAP

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at the signalling points sits on top of the SS7 protocol layers.

6. A method according to claim 5, wherein an adaptation layer is provided between the MAP and the IP and SS7 layers, the adaptation layer responding to a MAP dialogue initiation by determining whether or not the destination address for the dialogue corresponds to a co-located signalling point and, if the destination address for the dialogue does correspond to a co-located signalling point, then the adaptation layer determines the IP address corresponding to the destination address.

7. Apparatus for transmitting signalling information between two signalling points of a Public Land Mobile Network, the apparatus comprising;

first signal processing means for formulating said signalling information into a message according to the Mobile Application Part (MAP) protocol;

second signal processing means for formulating MAP messages according to a packet switched data transport mechanism; and

means for determining whether or not a destination signalling point for the MAP message is co-located and, if so, for passing the MAP message to said second signal processing means to provide for transmission of the message over a packet switched data network and, if not, for passing the MAP message to a Signalling System No. 7 (SS7) transport mechanism to provide for transmission of the message over an SS7 network.

8. A signalling point within a Public Land Mobile Network (PLMN), the signalling point comprising:

first signal processing means for formulating said signalling information into a message according to the Mobile Application Part (MAP) protocol;

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second signal processing means for formulating MAP messages according to a packet switched data transport mechanism; and

means for determining whether or not a destination signalling point for the MAP message is co-located and, if so, for passing the MAP message to said second signal processing means to provide for transmission of the message over a packet switched data network and, if not, for passing the MAP message to a Signalling System No. 7 (SS7) transport mechanism to provide for transmission of the message over an SS7 network.

9. A signalling point according to claim 8, wherein the signalling point acts as a signalling transfer point for messages received from non-co-located signalling points, whereby the signalling transfer point relays MAP messages to a co-located signalling point over the packet switched network.



Claims

1. A method of transmitting signalling information between two signalling points of a Public Land Mobile Network, which signalling points are co-located, the method comprising;
  - formulating said signalling information into messages according to the Mobile Application Part (MAP) protocol; and
  - transmitting the messages between the two signalling points using a packet switched data network.
2. A method according to claim 1, comprising a step of determining, at a signalling point wishing to send a MAP message, whether or not the message is destined for a co-located signalling point and, in the event that the destination signalling point is not co-located, then transporting the message over a network other than said packet switched data network.
3. A method according to claim 1 or 2, wherein the co-located signalling points of the PLMN coupled by the said packet switched data network include two or more of a Mobile Switching Centre (MSC), a Gateway Mobile Switching Centre (GMSC), a Home Location Register (HLR), and a Visitor Location Register (VLR).
4. A method according to any one of the preceding claims, wherein the packet switched data network is an IP network and the MAP sits on top of the IP layers at each of the co-located signalling points.
5. A method according to claim 4, wherein the co-located signalling points have access to an SS7 network and the MAP at the signalling points sits on top of the SS7 protocol layers.
6. A method according to claim 5, wherein an adaptation layer is provided between the MAP and the IP and SS7 layers, the adaptation layer responding to a MAP dialogue initiation by determining whether or not the destination address for the dialogue corresponds to a co-located signalling point and, if the destination address for the dialogue does correspond to a co-located signalling point, then the adaptation layer determines the IP address corresponding to the destination address.

7. Apparatus for transmitting signalling information between two signalling points of a Public Land Mobile Network, which signalling points are co-located, the apparatus comprising;

5 first signal processing means for formulating said signalling information into messages according to the Mobile Application Part (MAP) protocol;

second signal processing means for formulating MAP messages according to a packet switched data transport mechanism; and

transmission means for transmitting the formulated packet switched messages between the two signalling points over a packet switched network.

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8. A signalling point within a Public Land Mobile Network (PLMN), the signalling point comprising:

first signal processing means for formulating said signalling information into messages according to the Mobile Application Part (MAP) protocol;

15 second signal processing means for formulating MAP messages according to a packet switched data transport mechanism; and

transmission means for transmitting the formulated packet switched messages to a second co-located signalling point over a packet switched network.

20 9. A signalling point according to claim 8, wherein the signalling point acts as a signalling transfer point for messages received from non-co-located signalling points, whereby the signalling transfer point relays MAP messages to a co-located signalling point over the packet switched network.

25 10. A signalling point according to claim 8 or 9, wherein the signalling point comprises means for determining whether or not a destination signalling point for a MAP message is co-located and, if so, for passing the MAP messages to said second signal processing means and, if not, for passing the MAP messages to an SS7 transport mechanism to provide for transmission of the messages over an SS7  
30 network.

## P. ENT COOPERATION TREAT. /

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PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

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in its capacity as elected Office

<b>Date of mailing (day/month/year)</b> 23 August 2000 (23.08.00)	<b>Applicant's or agent's file reference</b> 8K23PC
<b>International application No.</b> PCT/EP99/10046	<b>Priority date (day/month/year)</b> 22 December 1998 (22.12.98)
<b>International filing date (day/month/year)</b> 17 December 1999 (17.12.99)	
<b>Applicant</b> KAVADAS, Bill et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

21 July 2000 (21.07.00)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

<p>The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No.: (41-22) 740.14.35</p>	<p>Authorized officer</p> <p>Charlotte ENGER</p> <p>Telephone No.: (41-22) 338.83.38</p>
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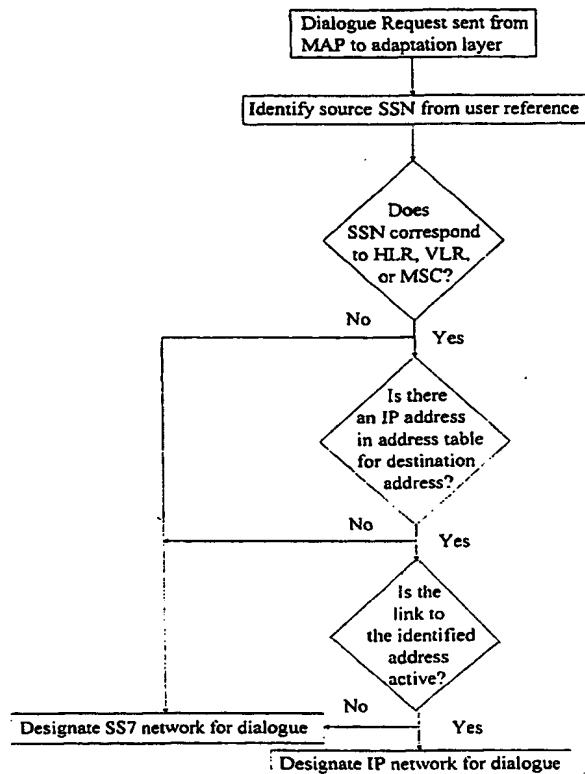
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>7</sup> : <b>H04Q 7/24, 3/00</b>	<b>A1</b>	(11) International Publication Number: <b>WO 00/38447</b> (43) International Publication Date: 29 June 2000 (29.06.00)
<p>(21) International Application Number: PCT/EP99/10046</p> <p>(22) International Filing Date: 17 December 1999 (17.12.99)</p> <p>(30) Priority Data: 982776 22 December 1998 (22.12.98) FI</p> <p>(71) Applicant (for all designated States except US): TELEFON-AKTIEBOLAGET LM ERICSSON (publ) [SE/SE]; S-126 25 Stockholm (SE).</p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): KAVADAS, Bill [AU/AU]; 454 Queens Pde, Fitzroy North, Melbourne, VIC 3068 (AU). GRAF, Leslie [AU/AU]; 3 Hendercourt, Ballwyn, Melbourne, VIC 3103 (AU). HOLLIS, Mark [AU/AU]; 1 Daintree Avenue, Park Orchads, Victoria (AU). NIESEN, Ralph [AU/AU]; 30 Mark Street, North Fitzroy 3068 (AU). WOO, Linda [AU/AU]; 3 Wilpena Place, Vermont South, Victoria 3133 (AU).</p> <p>(74) Agent: BORENIUS &amp; CO OY AB; Kansakoulukuja 3, FIN-00100 Helsinki (FI).</p>	<p>(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>	

(54) Title: TRANSPORT METHOD FOR THE MOBILE APPLICATION PART (MAP), AND APPARATUS THEREFOR

## (57) Abstract

A method of transmitting signalling information between two co-located signalling points of a Public Land Mobile Network. Signalling messages are formulated according to the Mobile Application Part (MAP) protocol and are passed to an adaptation layer which determines whether or not an IP address is available for the destination signalling point. If an IP address is available, The MAP messages are transmitted between the two signalling points using a packet switched data network, otherwise an SS7 network is used to transport the messages.



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## TRANSPORT METHOD FOR THE MOBILE APPLICATION PART (MAP), AND APPARATUS THEREFOR

### Field of the Invention

- 5 The present invention relates to a Mobile Application Part transport mechanism for use in a Public Land Mobile Network.

### Background to the Invention

- 10 In existing Public Land Mobile Networks (PLMN), signalling information, e.g. relating to call set-up procedures, management, and teardown, is generally carried between signalling points by a Signalling System No.7 (SS7) based transport mechanism. SS7 is a widely used transport protocol involving multiple protocol layers.
- 15 Information is exchanged between Mobile Switching Centres (MSCs), Home Location Registers (HLRs), and Visitor Location Registers (VLRs) using messages defined by the standardised Mobile Application Part (MAP) protocol, messages which are carried by the SS7 transport mechanism. More particularly, the SS7 layers involved in the transport of the MAP messages are:
- 20 a Message Transport Part (MTP) which handles *inter alia* message separation, error detection and correction, as well as an interface to the physical data link;
- a Signalling Connection and Control Part (SCCP) which is responsible for controlling signalling connections in the SS7 network as well as for routing between signalling points; and
- 25 a Transaction Capabilities Application Part (TCAP) which facilitates the use of advanced Intelligent Network (IN) services by providing for the exchange of information between signalling points using a connectionless service of the SCCP.

- The complexity of the conventional transport mechanism will be readily apparent, but
- 30 such complexity is required in order to ensure the correct routing and error free transmission of signalling data between the numerous signalling points of a PLMN.

### Summary of the Present Invention

- 35 It has been recognised by the inventors of the present invention that the complex SS7 transport mechanism is not necessary for transporting MAP messages between signalling points of a PLMN which are co-located, i.e. which are located in close proximity to one another. Thus, it is possible to employ a "lightweight" transport mechanism which

reduces or eliminates the coding and decoding requirements inherent in the SS7 transport mechanism.

According to a first aspect of the present invention there is provided a method of transmitting signalling information between two signalling points of a Public Land Mobile Network, which signalling points are co-located, the method comprising;

formulating said signalling information into messages according to the Mobile Application Part (MAP) protocol; and

transmitting the messages between the two signalling points using a packet switched data network.

As the signalling points to which the method of the present invention is applied are co-located, it is possible to couple the two signalling points using a direct connection.

Embodiments of the present invention remove the requirement for processing signalling information using TCAP and SCCP when the information is to be transmitted between co-located signalling points.

Preferably, the above method is used in a network after a signalling point wishing to send a MAP message has determined whether or not the message is destined for a co-located signalling point. In the event that the destination signalling point is not co-located, then a network other than said packet switched data network may be used to transport the message. One such alternative network is an SS7 network.

Preferably, the co-located signalling points of a PLMN coupled by the said packet switched data network include two or more of a Mobile Switching Centre (MSC), a Gateway Mobile Switching Centre (GMSC), a Home Location Register (HLR), and a Visitor Location Register (VLR). The signalling points may also include one or more Intelligent Network (IN) nodes.

Preferably, the packet switched data network is an IP network, where the MAP sits on top of the IP layers (including an IP protocol layer, and a TCP and/or UDP layer) at each of the co-located signalling points. Where the co-located signalling points have access to an SS7 network, the MAP at the signalling points may also sit on top of the SS7 protocol layers. More preferably, an adaptation layer is provided between the MAP and the IP and SS7 layers, the adaptation layer responding to a MAP dialogue initiation by determining whether or not the destination address (e.g. Global Title) for the dialogue corresponds to or is associated with a co-located signalling point. If the destination address (e.g. Global

Title) for the dialogue does correspond to a co-located signalling point, then the adaptation layer determines the IP address corresponding to the destination address.

According to a second aspect of the present invention there is provided apparatus for transmitting signalling information between two signalling points of a Public Land Mobile Network, which signalling points are co-located, the apparatus comprising;

first signal processing means for formulating said signalling information into messages according to the Mobile Application Part (MAP) protocol;

second signal processing means for formulating MAP messages according to a packet switched data transport mechanism; and

transmission means for transmitting the formulated packet switched messages between the two signalling points over a packet switched network.

According to a third aspect of the present invention there is provided a signalling point within a Public Land Mobile Network (PLMN), the signalling point comprising:

first signal processing means for formulating said signalling information into messages according to the Mobile Application Part (MAP) protocol;

second signal processing means for formulating MAP messages according to a packet switched data transport mechanism; and

transmission means for transmitting the formulated packet switched messages to a second co-located signalling point over a packet switched network.

The signalling point may also act as a signalling transfer point for messages received from non-co-located signalling points, whereby the signalling transfer point relays MAP messages to a co-located signalling point over the packet switched network.

Preferably, the signalling point comprises means for determining whether or not a destination signalling point for a MAP message is co-located and, if so, for passing the MAP messages to said second signal processing means and, if not, for passing the MAP messages to an SS7 transport mechanism to provide for transmission of the messages over an SS7 network.

#### Brief Description of the Drawings

For a better understanding of the present invention and in order to show how the same may be carried into effect reference will now be made, by way of example, to the accompanying drawings, in which:

Figure 1 illustrates schematically a part of a Public Land Mobile Network;



Figure 2 illustrates the transport mechanism protocol stack implemented at certain signalling points of the PLMN of Figure 1; and

Figure 3 is a flow diagram illustrating a method of transmitting Mobile Application Part messages between signalling points of the PLMN of Figure 1.

#### Detailed Description of Certain Embodiments

In Figure 1 there is illustrated schematically a Public Land Mobile Network (PLMN) comprising two Gateway Mobile Switching Centres (GMSCs) 1,2 which provide the interface between the PLMN and a Public Switched Telephone Network (PSTN) 3. The GMSCs 1,2 "represent" the PLMN from the view point of the PSTN 3 and signalling communications therebetween are carried using the ISDN User Part (ISUP) protocol. The GMSCs may also provide the interfaces between the PLMN and other networks although this is not shown in Figure 1.

Within the PLMN, it is necessary to communicate signalling information between signalling points of the network for the purpose of call set-up, management, and teardown. Figure 1 illustrates a number of signalling points within the PLMN including: the GMSCs 1,2; Mobile Switching centres (MSCs) 4,5 which are responsible for routing calls within the PLMN; Visitor Location Registers (VLRs) 6,7 which maintain a record of the subscribers registered with associated MSCs at any given time; and Home Location Registers (HLRs) 8,9 which maintain a permanent record of the PLMN subscribers together with a dynamic record of the location of those subscribers at any given time. These signalling points are in close proximity to one another, i.e. they are "co-located". In some circumstances the co-located signalling points may be located in the same room.

Signalling information is conveyed between the various signalling points of the PLMN using the Mobile Application Part (MAP) interface protocol. Conventionally, MAP messages are transported using the SS7 transport mechanism. This mechanism will not be described in detail here (reference should be made for example to "Understanding Telecommunications", Vols 1 & 2, Studentlitteratur, Lund, Sweden, ISBN 91-44-00214-9), although Figure 1 does illustrate the provision of an SS7 network in which SS7 signalling links (illustrated by broken lines) may be routed via a Signalling Transfer Point (STP) 10. The SS7 transport mechanism is also used to convey ISUP signalling messages between the GMSCs 1,2 and the PSTN 3.

In Figure 1, the solid lines indicate Ethernet connections between signalling points. These Ethernet connections are used to carry IP datagrams encapsulating MAP messages,

providing an alternative to the SS7 transport mechanism described in the preceding paragraph. It is noted that only direct ethernet connections (point-to-point) are provided between signalling points, i.e. there is no requirement for routers in the IP network.

5 Figure 2 shows the protocol which is implemented at each of the PLMN signalling points. The MAP 11 sits on top of a so-called "adaptation layer" 12 which in turn sits on top of two distinct protocol stacks. A first of these stacks 13 provides the conventional SS7 transport mechanism, whilst the second 14 provides for the IP transport mechanism. As far as the MAP 11 is concerned, the adaptation layer 12 behaves identically to the TCAP  
10 so that no modifications to the MAP 11 are required.

Initialisation of a MAP dialogue commences with a dialogue request message being passed from the MAP 11 to the adaptation layer 12. The adaptation layer uses a user reference contained in the dialogue request message to determine the associated Sub-  
15 System Number (SSN). If the SSN does not indicate that the user is a HLR, VLR, or MSC, the dialogue is designated for SS7 and the normal SS7 procedures utilised (i.e. protocol stack 13).

If, on the other hand, the SSN does indicate that the user is a HLR, VLR, or MSC, the  
20 called address, i.e. Global Title (GT), is checked by the adaptation layer 12. Each of the MSC/VLRs, GMSCs, and HLRs which are co-located with the originating signalling point is associated with a Global Title series. These series are pre-recorded in an address table, accessible to the adaptation layer 12. The address table contains a mapping between Global Title series and IP addresses. If the check determines that the called Global Title is  
25 not a member of one of the recorded Global Title series, the dialogue is again transported over SS7. However, if the check confirms that the called Global Title is a member of a recorded Global Title series, then, providing that the TCP/IP link towards that address is active, a request granted message returned to the MAP 11 by the adaptation layer. In the event that the identified link is not active, then the dialogue is once again transported over  
30 SS7. Subsequent messages relating to the same dialogue are transported over IP or SS7 depending upon the initial checks performed by the adaptation layer.

To limit the processor load required for checking an address called by a MAP dialogue request message, the number of addresses contained in the address table is restricted to a  
35 relatively small number, i.e. the number of co-located signalling points which can make use of the lightweight IP transport mechanism is restricted. A suitable number of signalling points may be six or less.

Figure 3 is a flow diagram illustrating the processing steps carried out at a signalling point following initiation of a MAP dialogue. Typically, these steps are carried out by a suitably programmed computer, or by one or more Digital Signal Processors (DSPs), although other suitable implementations will be readily apparent.

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It will be appreciated by the person of skill in the art that various modifications may be made to the above described embodiment without departing from the scope of the present invention. For example, rather than using the TCP routing protocol above the IP protocol, a simpler routing protocol may be used, e.g. Point to Point Protocol (PPP). In a further  
10 modification, the invention may be employed to relay MAP messages received at a signalling transfer point from an originating signalling point, not co-located with the receiving signalling point, to a destination signalling point which is co-located with the signalling transfer point. In this case, the signalling transfer point will check whether or not the destination address of the received MAP messages is contained within the address  
15 table already described and, if so, determine the associated IP address.

Claims

1. A method of transmitting signalling information between two signalling points of a Public Land Mobile Network, which signalling points are co-located, the method comprising;  
5       formulating said signalling information into messages according to the Mobile Application Part (MAP) protocol; and  
          transmitting the messages between the two signalling points using a packet switched data network.
- 10       2. A method according to claim 1, comprising a step of determining, at a signalling point wishing to send a MAP message, whether or not the message is destined for a co-located signalling point and, in the event that the destination signalling point is not co-located, then transporting the message over a network  
15       other than said packet switched data network.
3. A method according to claim 1 or 2, wherein the co-located signalling points of the PLMN coupled by the said packet switched data network include two or more of a Mobile Switching Centre (MSC), a Gateway Mobile Switching Centre (GMSC), a Home Location Register (HLR), and a Visitor Location Register (VLR).  
20
4. A method according to any one of the preceding claims, wherein the packet switched data network is an IP network and the MAP sits on top of the IP layers at each of the co-located signalling points.
- 25       5. A method according to claim 4, wherein the co-located signalling points have access to an SS7 network and the MAP at the signalling points sits on top of the SS7 protocol layers.
- 30       6. A method according to claim 5, wherein an adaptation layer is provided between the MAP and the IP and SS7 layers, the adaptation layer responding to a MAP dialogue initiation by determining whether or not the destination address for the dialogue corresponds to a co-located signalling point and, if the destination address for the dialogue does correspond to a co-located signalling point, then the  
35       adaptation layer determines the IP address corresponding to the destination address.

7. Apparatus for transmitting signalling information between two signalling points of a Public Land Mobile Network, which signalling points are co-located, the apparatus comprising;

first signal processing means for formulating said signalling information into messages according to the Mobile Application Part (MAP) protocol;

second signal processing means for formulating MAP messages according to a packet switched data transport mechanism; and

transmission means for transmitting the formulated packet switched messages between the two signalling points over a packet switched network.

8. A signalling point within a Public Land Mobile Network (PLMN), the signalling point comprising:

first signal processing means for formulating said signalling information into messages according to the Mobile Application Part (MAP) protocol;

second signal processing means for formulating MAP messages according to a packet switched data transport mechanism; and

transmission means for transmitting the formulated packet switched messages to a second co-located signalling point over a packet switched network.

9. A signalling point according to claim 8, wherein the signalling point acts as a signalling transfer point for messages received from non-co-located signalling points, whereby the signalling transfer point relays MAP messages to a co-located signalling point over the packet switched network.

10. A signalling point according to claim 8 or 9, wherein the signalling point comprises means for determining whether or not a destination signalling point for a MAP message is co-located and, if so, for passing the MAP messages to said second signal processing means and, if not, for passing the MAP messages to an SS7 transport mechanism to provide for transmission of the messages over an SS7 network.

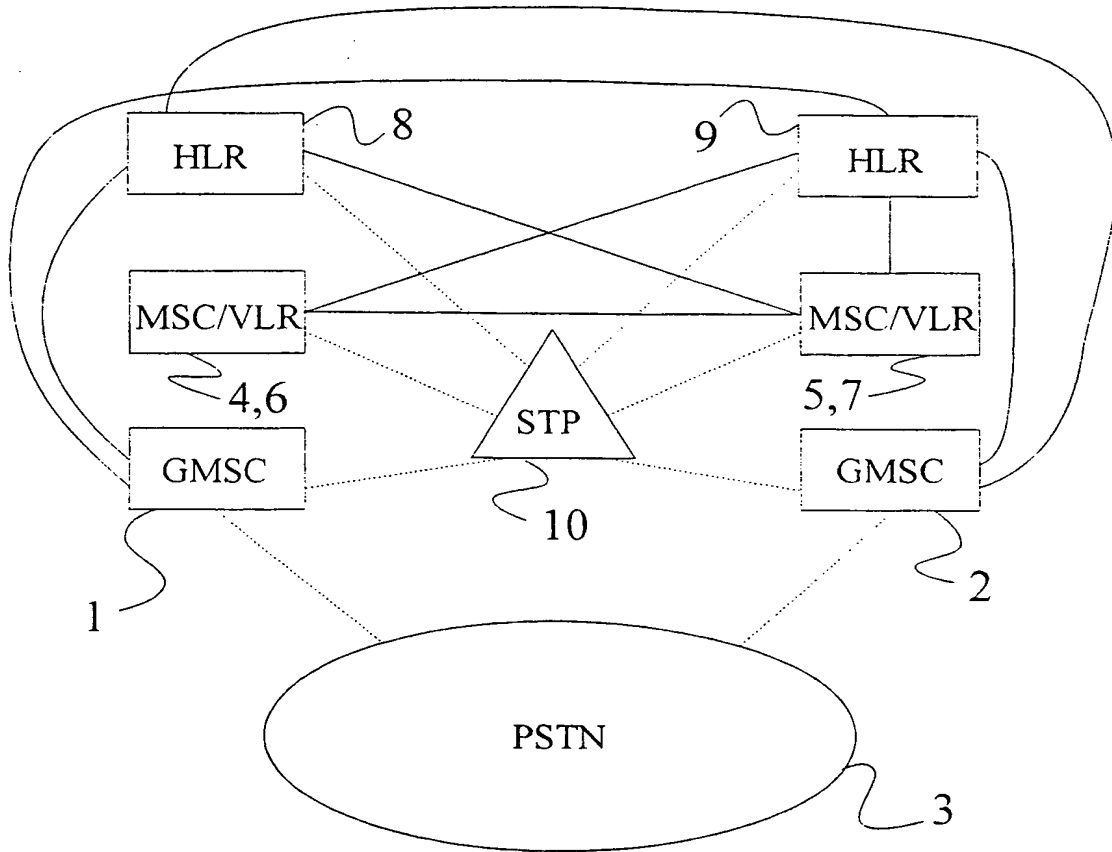


Figure 1

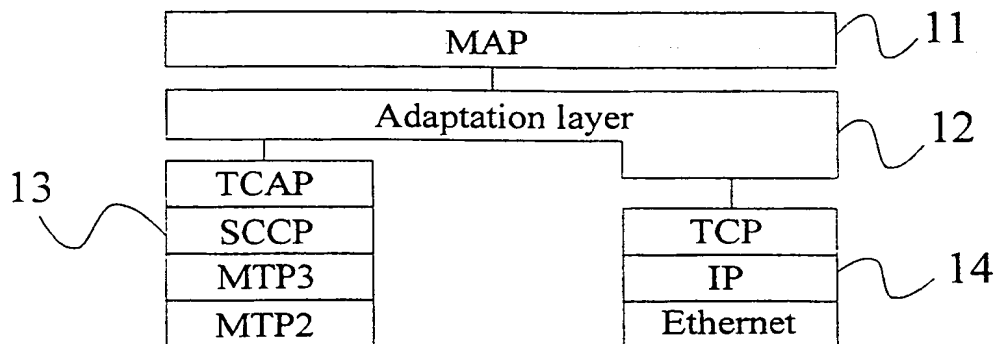
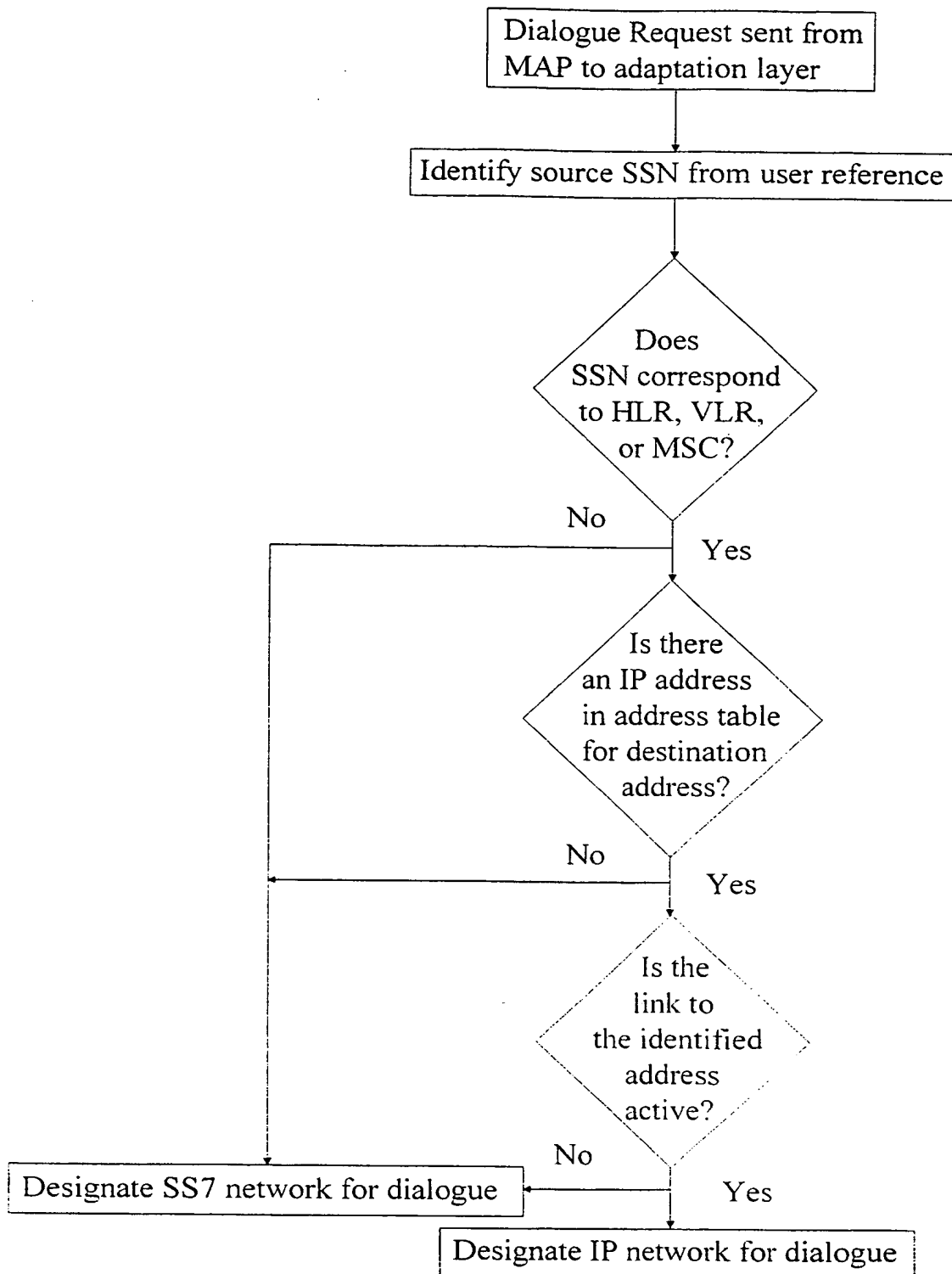


Figure 2

Figure 3

# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>8K23PC</b>	<b>FOR FURTHER ACTION</b>		see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. <b>PCT/EP 99/ 10046</b>	International filing date (day/month/year) <b>17/12/1999</b>	(Earliest) Priority Date (day/month/year) <b>22/12/1998</b>	
Applicant <b>TELEFONAKTIEBOLAGET L M ERICSSON (PUBL) et al</b>			

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

a. With regard to the language, the International search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the International search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (see Box II).

**4. With regard to the title,**

☐ the text is approved as submitted by the applicant.

☒ the text has been established by this Authority to read as follows:

**TRANSPORT METHOD FOR THE MOBILE APPLICATION PART (MAP), AND APPARATUS THEREFOR**

**5. With regard to the abstract,**

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

**6. The figure of the drawings to be published with the abstract is Figure No.**

☐ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☒ because this figure better characterizes the invention.

3

☐ None of the figures.



## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 99/10046

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 H04Q7/24 H04Q3/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04Q H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 544 447 A (AMERICAN TELEPHONE & TELEGRAPH) 2 June 1993 (1993-06-02) page 2, line 38 - line 43 page 4, line 24 - line 48 page 5, line 13 - line 24 figures 2,3,6 --- -/--	1-3,7,8

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

\* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&amp;" document member of the same patent family

Date of the actual completion of the international search

18 April 2000

Date of mailing of the international search report

27/04/2000

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Authorized officer

Kampouris, A

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 99/10046

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GHOSAL A: "AN APPLICATION OF IN TECHNOLOGY FOR 800 MHZ PCS" INTERNATIONAL CONFERENCE ON UNIVERSAL PERSONAL COMMUNICATIONS, US, SAN DIEGO CA USA, 27 September 1994 (1994-09-27) - 1 October 1994 (1994-10-01), pages 624-628, XP000198358 IEEE, Piscataway, NJ USA page 625, right-hand column, line 15 - last line page 626, left-hand column, line 15 -right-hand column, line 16 page 627, right-hand column, line 5 - line 7 figure 2 table 1	1-5,7-10
A	WO 97 42774 A (ERICSSON TELEFON AB L M) 13 November 1997 (1997-11-13) page 5, line 20 -page 6, line 13	6,8-10
A	US 5 732 213 A (SWETMAN WILLIAM C ET AL) 24 March 1998 (1998-03-24) column 3, line 1 - line 8 column 5, line 20 - line 29 column 6, line 37 - line 45	5
A	US 5 841 854 A (MELAMPY PATRICK J ET AL) 24 November 1998 (1998-11-24) column 15, line 57 -column 16, line 45 table 1	3,5
A	EP 0 381 365 A (IBM) 8 August 1990 (1990-08-08) column 4, line 11 - line 28	6